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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/638,194	08/11/2000	Sumio Koiwa	S004-4061	8149

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EXAMINER
MONDT, JOHANNES P

ART UNIT	PAPER NUMBER
2826	

DATE MAILED: 03/11/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/638,194	KOIWA, SUMIO	
	Examiner	Art Unit	
	Johannes P Mondt	2826	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *22 January 2002* .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-14* is/are pending in the application.

4a) Of the above claim(s) *8-14* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-7* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Election/Restrictions

1. Newly submitted claims 8-14 are directed to an invention that is independent or distinct from the invention originally claimed for the following reasons: the invention originally claimed is a photodiode device, classified in class 257, sub-class 431; while the invention to which newly submitted claims 8-14 are directed is a method of making a photodiode device, classified in class 438, sub-class 48.

The inventions are distinct, each from the other because of the following reasons:

Inventions I and II are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP §806.05(f)). In the instant case, unpatentability of the Group II invention would not necessarily imply unpatentability of the Group I invention, because the device of the Group I invention could be made by a process materially different from that of the Group II invention. For example, the process of claim 8 can be materially altered by taking as point of departure a semiconductor substrate shaped in such a manner that etching of any kind in not necessary, namely: shaped in the final form of the substrate obtained after the etching step of claim 8.

Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, the fields

of search are not co-extensive and separate examination would be require, restriction for examination purposes as indicated is proper.

Since applicant has received an action on the merits for the originally presented invention, this invention has been constructively elected by original presentation for prosecution on the merits. Accordingly, claims 8-14 are herewith withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

Response to Amendment

Amendment A filed 01/22/02 has been considered prior to this Detailed Office Action. In Amendment A all original claims have been amended substantially, while new claims 4-14 have been added. Therefore, the examiner's response in "Response to Arguments" will essentially be restricted to those aspects still relevant in view of the amendment of the claims. See "Response to Arguments".

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. ***Claims 1, 3-7*** *are rejected* under 35 U.S.C. 102(b) as being anticipated by the international journal publication by Wen-Shiung Lour and Chung-Cheng Chang in Solid-State Electronics, Vol. 39, issue 9, pp. 1295-1298 (1996).

With regard to claim 1: Wen-Shiung Lour and Chung-Cheng-Chang teach (cf. Fig. 1) a (PIN) photodiode comprising an optical detection portion for detecting an optical signal and outputting a photoelectric conversion signal (inherently for a photodiode, detection occurs through conversion of the optical incoming signal to an electric signal), the optical detection portion having a semiconductor substrate of first conductivity type (P-Si) and an absorption layer consisting of i-ZnSe, also a semiconductor, thus together forming the equivalent of the "semiconductor substrate of first conductivity type" in the present invention (I-Zn-Se is p-type with negligible doping concentration); a plurality of (in fact: two) semiconductor layers of a second conductivity type (n-type here and indicated by "n+") formed in spaced-apart relation (i.e., spaced apart from each other) in a surface of the semiconductor substrate (surface marked to be 0.1 μm from the cathode K in Fig. 1) so that an etched surface portion (cf. p. 1296, first paragraph) of the semiconductor substrate is disposed between the semiconductor layers.

With regard to claim 3: in the previous paragraph claim 1 on which claim 3 depends has been shown to be unpatentable in view of being anticipated by Wen-Shiung Lour and Chung-Cheng Chang. Furthermore, in their aforementioned journal article Wen-Shiung Lour and Cheng-Cheng Chang specifically mention with regard to the device depicted in their Fig.1 that formed the basis of the above stated rejection of

claim 1 that "standard photolithography and wet etching techniques are used to implement the device". See page 1296 of their article, first sentence. Therefore, claim 3, which only adds to claim 1 the specification that wet etching is used, clearly is also anticipated by Wen-Shiung Lour and Chung-Cheng Chang.

In summary, claims 1 and 3 are anticipated by the journal publication by Wen-Shiung Lour and Chung-Cheng Chang (September 1996).

With regard to claims 4-7: claims 4-7 merely entertain the selection of either n- or p-type conductivities for the first and second type conductivities or conductive types in the invention as defined by claim 1. The examiner takes official notice that such selection is fully standard in the semiconductor device art and has therefore no patentable weight.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. ***Claim 2*** *is rejected* under 35 U.S.C. 103(a) as being unpatentable over the journal publication by Wen-Shiung Lour and Chung-Cheng Chang in Solid-State Electronics, Vol. 39, issue 9, pp. 1295-1298 (1996).

Claim 2 depends on claim 1 which was shown to be anticipated by Wen-Shiung Lour and Chung-Cheng Chang. Furthermore, the examiner takes official notice of the circumstance that for reasons of efficiency the selection of the value of the "distance

between the second conductive type semiconductor layers formed on the surface of the first conductive type semiconductor region" as performed by one of ordinary skill in the arts must be between "0.5 to 2 times a width of the depletion layer in the horizontal direction formed by reverse biasing" (reverse biasing is the functional operational mode of photodiodes): if this distance were chosen to be less than half the width of the depletion layer there would be no net gain in having two separate second conductive type semiconductor regions and two electrodes. The cusp visible in Fig. 3 of the invention and cited as Prior Art would then be smoothed out, hence this Prior Art satisfies this part of the inequality. On the other hand, if the aforementioned distance were chosen to be greater than twice the depletion layer width the depletion layer would no longer be contiguous, resulting in a loss of photosensitivity because the first conductive type semiconductor region between the second conductive type semiconductor areas would be left unexploited. This would also be in contrast with the Prior Art shown in Fig. 3 of the present invention because this figure does show a contiguous depletion area. Finally, it is inherent in a photodiode of the type taught by the cited prior art that a reverse bias to the photodiode forms a depletion layer in the semiconductor substrate.

Therefore, it would have been obvious to one of ordinary skills in the art to further specify the device taught by Wen-Shiung Lour and Chung-Cheng Chang so as to select the distance between the second conductive type semiconductor regions according to the further limitation formulated in claim 2.

Response to Arguments

The change in title removes the objection against the specification. All original claims have been substantially amended. Furthermore, no detailed reason for traverse of said original claims has been included in Amendment A. Instead arguments for traverse are founded on the newly introduced language in claims 1-3. However, the prior art, at least as cited in the present Detailed Office Action, also qualifies as prior art against the newly amended claims 1-3, because an etched surface portion is disposed between the semiconductor layers in the cited prior art.

Conclusion

4. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any

extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Johannes P Mondt whose telephone number is 703-306-0531. The examiner can normally be reached on 8:00 - 18:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan J Flynn can be reached on 703-308-6601. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-308-7724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

JPM
March 4, 2002